УДК [61+615.1](06)(043.2)
ББК 5+52.81
А 43
ISBN 978-985-21-1569-8

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THE ROLE OF HORMONES IN APPETITE REGULATION : INTERACTION OF NEUROPEPTIDE Y WITH LEPTIN, GHRELIN, INSULIN

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This report discusses about the role of Neuropeptide Y, Leptin, Ghrelin, Insulin in the human appetite regulation (homeostasis of metabolism) and the synergistic action of hormones on stimulating and inhibiting the neuropeptide Y synthesis.

Out of the key hormones involved in appetite control, this study discusses mainly about ghrelin ,leptin and insulin ; their synthesis site and how they regulate the appetite intake. The types of signals transmitted from the endocrine system of Gastrointestinal tract to the nervous centres of hypothalamus in order to regulate hunger and satiety ; Long acting signal , Short acting signal and cases of exceptions where a mixture of both signals is transmitted.

Leptin’s principle site of action is the brainstem and hypothalamus.It's function in the body pertains to the balance between energy expenditure and energy intake. As the amount of adipose tissue decreases amount of leptin produced and that cross blood brain barrier decreases proportionally ; this stimuli is perceived as energy deficit by brain. Leptin receptor is activated in response which leads to inhibition of Neuropeptide Y and Agouti related peptide (AgRP) and activation of alpha melanocyte stimulating hormone that results in stimulation of hunger.

Ghrelin " hunger hormone " secreted by the stomach reaches the brain by crossing the blood-brain barrier, and ghrelin also transmits its signal through the vagal nerve.By stimulating the activity of NPY/AGRP neurons and decreasing the activity of POMC and CART neurons, ghrelin increases appetite and food intake.Ghrelin is also involved in long-term body weight regulation.

Insulin, a primary metabolic hormone. An increase in the level of circulating insulin produced by its prandial release from endogenous stores is associated with the state of satiety. Interaction with other hormones may have either positive or negative effect on its synthesis and effect. When insulin rises and falls over time, instability will occur which may cause resistance to some of these hormones. Prolonged resistance to insulin and insulin that rises and falls throughout the day may eventually cause an erosion of the production and regulation of insulin amounts by the pancreas, and an increase in the amount of insulin in the blood.

There are two primary neuronal circuit within the ARC (arcuate nucleus) which integrate signals of nutritional status, and influence energy homeostasis. One neuronal circuit inhibits food intake, via the expression of the neuropeptides which are Pro-opiomelanocortin (POMC) and Cocaine- and amphetamine-regulated transcript (CART) and The Neuronal circuit which stimulates food intake, via the expression of neuropeptides which are Agouti-related peptide (AgRP) and Neuropeptide Y (NPY).

The role of neuropeptide Y (NPY) in the appetite regulation is that which is one of the stimulating hormones for hunger.NPY initiates appetite drive through the NPY G- protein coupled receptors (primarily Y1 and Y5). Insulin and Leptin which are the two hormones together produce an effect of inhibition in NPY Synthesis and hormones such as Glucocorticoids and ghrelin stimulates the Synthesis of NPY.

Some examples associated with pathologies associated with disrupted appetite regulation are lipodystrophy, Insulin and leptin resistance leading to obesity, hypothyroidism and under weight are discussed.

It is evident that each of the hormones play a vital role in the Body constitution depending on the blood's environment with glucose, fat and cholesterol levels ; individually as well as combinedly. Prospects for further research is that the artificial production under genetic modifications for the hormones mentioned above and detailed analysis of how the above hormonal effects could be reversed physiologically, will lead to save the mankind with different pathologies with disrupted hormonal productions.